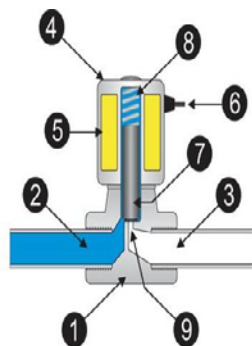


Sheet (2)

1- What is meant by solenoid? Give examples of devices used it.

- A solenoid is an electromechanical device which allows for an electrical device to control the flow of a gas or liquid (valves).
- The electrical device causes a current to flow through a coil located on the solenoid valve.
- This current flow in turn results in a magnetic field which causes the displacement of a metal actuator.
- Electromagnetic solenoids are used in hotel door locks, water-pressure valves and in air conditioning systems



Parts of Solenoid Valve

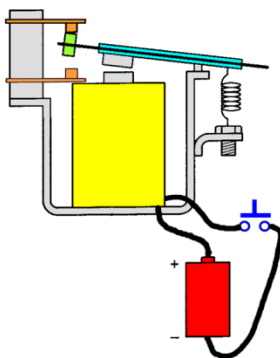
- 1) Valve body
- 2) Inlet port
- 3) Outlet port
- 4) Coil / Solenoid
- 5) Coil winding
- 6) Lead wires
- 7) Plunger or piston
- 8) Spring
- 9) Orifice



Solenoid basic wired coil

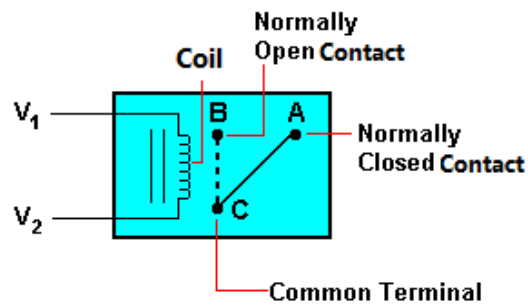
2- What is the relay? Describe with draw its operation.

- An electromagnetic relay is a magnetic switch. It uses electromagnetism to switch contacts.
- A relay will usually have only one coil but may have any number of different contacts.

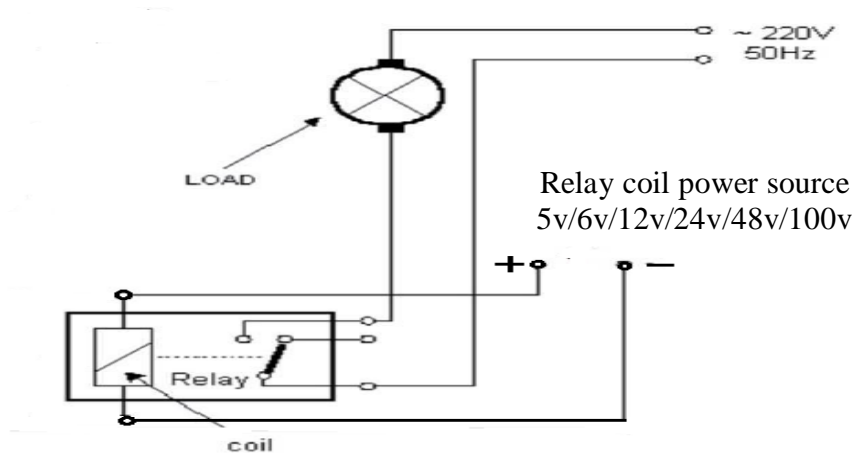


With no current flow through the coil (the coil is de-energized), the armature is held away from the core by spring tension.

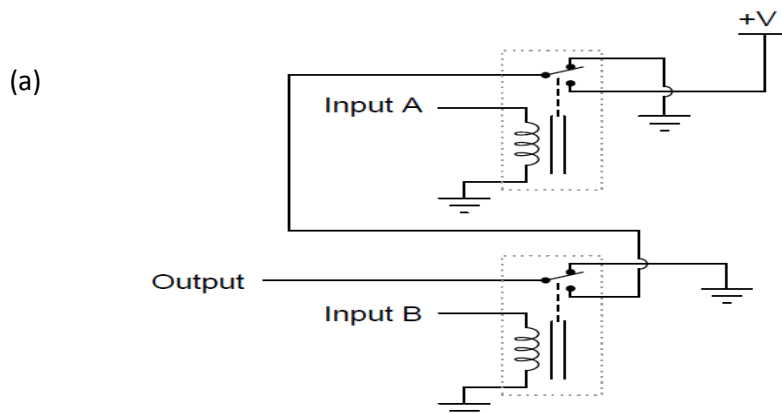
When the coil is energized, the electromagnetic field moves the armature causing the contact points of the relay to open or close.



3- Explain with draw the relay connection with any 220V load.

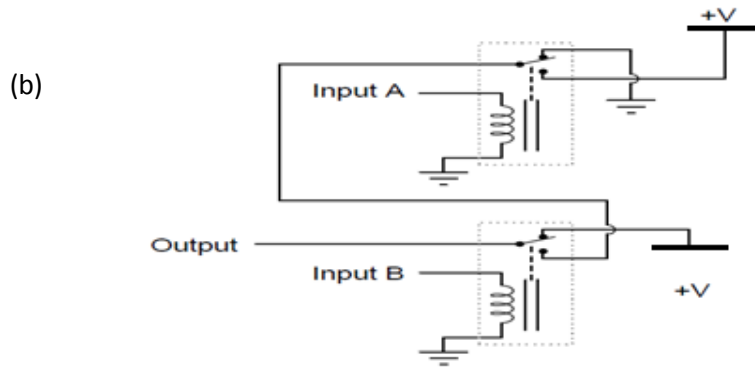


4- The following relay circuits simulate a standard digital logic gate function:



A	B	output
0	0	0
0	1	0
1	0	0
1	1	1

Output= A.B AND Gate



A	B	output
0	0	1
0	1	0
1	0	1
1	1	1

$$\text{Output} = A'B' + AB' + AB = A + A'B' = A + B'$$

Write a truth table for these circuits.

5- Explain the control action using PLC in escalators.

Most of the time the escalator in high traffic, work at the rated operating state, in the absence of passengers is still rated speed operation, with energy consumption (also the life time is reduced)

PLC control the speed of the escalator when no one take the escalator to save energy and increase the life of it.

6- Show the main difference between user memory and system memory used in PLC.

Executive Memory (System Memory)

- The **executive memory** is a collection of permanently stored programs that are considered part of the PLC itself. These supervisory programs direct all system activities, such as execution of the control program and communication with peripheral devices.
- The executive section is the part of the PLC's memory where the system's available instruction software is stored (i.e., relay instructions, block transfer functions, math instructions, etc.).
- This area of memory is not accessible to the user (**ROM Memory**).

- The executive memory is called system memory

Application Memory (User Memory)

- The **application memory** provides a storage area for the user-programmed instructions that form the application program.
- The application memory area is composed of several areas, each having a specific function and usage.

The application memory is called user memory

7- Explain how the power supply has the function of supplying well-regulated power and protection for other PLC system components.

- Its responsibility is not only to provide internal DC voltages to the system components (i.e., processor, memory, and input/output interfaces), but also to monitor and regulate the supplied voltages and warn the CPU if something is wrong.
- The power supply, then, has the function of supplying well-regulated power and protection for other PLC system components as it contains (low voltage transformer - bridge rectifier circuit – filter – regulator)
- Most PLCs, however, require a 120 VAC or 220 VAC power source, while a few controllers will accept 24 VDC